PORSCHE PANORAMA

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ON LAND OR WATER
(Or, Porsche Faces Laugh)

Art Bartholomee, Baltimore, sends in this true-life story. PCA'ers who ran the MSCA Chesapeake Trophy Rallye all swear they were up the same creek.

PCA'er Vern Davies requested my aid in laying out a rallye. The team consisted of two 1600N's, the two of us, and our wives.

There had been exceessively heavy rainfall, and one particular very narrow muddy road, wide enough for only one car, became impassable, blocked by two tow trucks, a large Detroit sedan and spectators. Beyond this roadblock was water--lots of it, and moving by fast. What was normally a narrow shallow ford had become a raging young river. In its center and deepest part was a big Detroit sedan - water at the level of the top of its wheels. The Detroit iron in the road had been towed out of the water -- having been in since the night before.

We asked spectators if they thought we could traverse the ford. They were obviously amused, and thought we were stark crazy -- for they had seen what had happened to the "tall" Detroit stuff. Then my wife spoke up impetuously, "These float". (She had seen the pictures in Popular Mechanics of the VW floating -- so she assumed the Porsche would also.) I added, "Sure".

From there on, it was a matter of saving face - and mustering plenty of courage. The water was about 2-1/2 ft. deep in the center, and since the car was in the middle, it would be necessary to scribe a large arc to avoid it.

Vern was to make the crossing. The two tow trucks and the sedan were pulled off the road - and the way was now clear for the crossing except for the sedan in the center of the stream. Vern fired up his car and by using hand throttle, obtained a throttle setting of about 2000 r.p.m. We figured that with sufficient momentum and proper aim, the deepest part could be forded if the Porsche would float and continue to run.

Off roared the beetle in low gear, hitting the water with such a splash that the water went up the hood, over the roof and down the back, completely covering the car for a moment. (Visibility of driver--zero.) At the deepest part, only momentum carried him across, as the wheels lost traction, and the engine raced -- to slow down again when the wheels got a bite in the shallower water on the opposite side.

The car was dripping with water -- the eyes of the spectators were wide with amazement. But the inside of the car was dry except for about a cup of water that came in around the rear corner of the driver's door. The engine room was very wet from water coming through the grill, but the engine continued to run unfailingly.

I had had a camera but stood frozen while the crossing was made and failed to snap the shutter. Therefore, Vern unhesitatingly entered his car -- and made the return trip, as per the picture.

Vern was now back where he started from, but since we were now confident that the Porsches would float, we all boarded our cars and crossed the water successfully.

(This lured a recent arrival in a huge stakebodied truck to attempt the crossing -- and we drove off with him bogged beside the stuck sedan.)

The only detrimental effect of all this was a rough clutch action and no brakes, but these were back to normal within a few miles. I would recommend, however, should you have occasion to float your Porsche that you make sure to turn off the heater. If you don't you will find the inside of your car suddenly full of steam and the windows so thoroughly fogged you cannot see.

I would like to end this article by saying that my Porsche continues to surprise me every day. It is the most fabulous car I have ever driven.

STOPPING TOP FLUTTER ON SPEEDSTERS

If your top flutters, one improvised method to stop it is to place some article - such as a map - between the windshield frame and the rubber molding, so that it will disturb the air flow. It must be remembered that the article must have enough rigidity to disturb the air stream and not flutter itself. When a map is used, unfold it once and place the long axis parallel to the windshield frame.

--Kenneth J. Varker

BE at the P. P. ★

KUDOS

Allan and Betty Meredith, Va., for 1st in class and 2nd over-all, in the Chesapeake Trophy Rallye.

Bengt Soderstrom and Lake Underwood, N.J., for their wins in the Lime Rock opening day races. In their respective classes, Bengt was second in his 1300, and Lake first in his Carrera.

Brooke Armat, Potomac Region, for 1st place in PCA's March rallye.

Gamble & Eliz. Mann, Va., for first place in Potomac Region's April rallye; also for third in class in Chesapeake Trophy Rallye.

The members of Potomac Region PCA who chipped in and had ye ed's car ("rather mouldy looking" quoting from an article in NY Region's Newsletter) painted -- and thanks!

John P. Brophy, Utah, for a second and third in his class at Casper Road Races last fall, and for fifth over-all at Palm Springs in April. (This latter was his second road race, and he came in behind three Carreras, and a very potent Super -- most of which could not be used for street driving.) In addition, he got the fastest time of day in recent Utah Region SCCA hill-climb, beating Corvettes, Jags, Healeys, etc. This boy is one to watch, if you can see him as he goes by in his 1600 Super!

THE CHESAPEAKE TROPHY RALLYE

The CTR this year again saw PCA well represented, both in number and in the winner's circle.

Al and Betty Meredith, Va., carried off prizes for first in class and second over-all, and the over-all winners of last year's rallye, Gamble & Elizabeth Mann, took off third in class silver.

There were four PCA teams entered, and Team 1, composed of Twigg/Healey, Mann/Mann, and Ford/Schaefer took second place team prize - out of eleven teams entered all told. (A note here: PCA'er Allan Fine, Richmond, drove one of the cars in the winning team, but entered with a different club affiliation).

As usual, the rallye was a tremendous success and represented the kind of bang-up job MSCA has become noted for. (For example of some of the road conditions encountered in this rallye, see the pic accompanying Art Bartholomee's story in this issue about floating Porsches in laying out "a" rallye.)

LIME ROCK INAUGURAL

The 27-28 April Lime Rock Inaugural Race opened the 1957 New England Regional SCCA calendar of sports car events. The aspect of weather, spectator attendance and competitive classes proved it a successful venture.

Class G production was an Alfa victory, with Ted Sprigg placing a Guillietta into a well driven first over-all. The single Porsche entrant was Bengt Soderstrom in a 1300 Super. Ben successfully filled the vacated notch of Pupilidy (now Cooper) and nailed a clean second over-all against a field of Guilliettas and Veloces.

Class F production was a "Porsche field day". Lake Underwood remained unvanquished and easily stayed in the number one position. Emerging from a pack of 1600 Supers was the 1500 Super Speedster of Bill Welsh, of Dayville, Conn. Turning laps of 1:18 and 1:19 for Lime Rock's mile and a half, Welsh fought through traffic in a drive that brought an estimated 6500 spectators to their feet. Closing rapidly on Lake, Bill achieved a spectacularly driven second over-all.

Third over-all went to Don Urian of Mass. in a 1500 N Speedster. Laurels are due this quiet newcomer to Porsche ranks, who proved the worth of a well driven normal. Fourth was earned by Dick Lerner of N. Y., in a 1600 Super Speedster.

Classes F and D ran a 5-lap match race that turned into a battle royal, between Bob Holbert in an RS and Bruce Kessler in an ex-von Neumann Testa Rossa. Holbert held his lead until the checkered flag fell on Kessler who out-accelerated him on the straight before the finish line. Holbert's Spyder was on its maiden run and was superior proof of Porsche's development of the giant killer.

--Dave de Wolf

NEWS FROM THE REGIONS

Northern New Jersey Region

The first official meeting of the Northern New Jersey Region PCA will be held May 25, a dinner meeting to be held at the Fireside Inn, 231 Claremont Ave., Montclair, N. J., at 7:00 p. m. Cost is $3.00 per person, payable at the door.

The guest speaker will be Mr. Erich Filius, factory representative.

To make reservations, contact C.E. Fowler, Regional Director, 175 Henshaw Ave., Springfield, N. J.

Gulf Coast Region

The attached pictures show some of the cars that gathered for the organizational meeting on April 7th. This region plans to have regular meetings and anyone in this area should contact Jerome Gonzales, 5638 Windemere, Houston Texas, for further details.

Porsches lined up for new Gulf Coast regional meeting..day foggy, but PCA'ers enthusiastic

New England and Westchester Regions

March 30th was the date of the combined New England and Westchester Regions' dinner meeting at Cheshire, Conn. 52 members, wives and guests attended.

The dinner meeting was a huge success - even though the originally announced guest speaker (von Hanstein) was unable to make the date, and his replacement, also, begged off at the last moment. However, Mr. Sandy Sanderson, of Wakefield Oil, was present and gave a brief lecture followed by a discussion period. Luke Ziluca reported on the Sebring races, pictures were shown of European Grand Prix racing, and plans for the rallye to the Lime Rock course were announced.

Texas Region

Tom Donaldson reports from Texas that he, Roy Keisling and Les Morissett represented the club at the Mansfield, La. races. He says that he can't say how they all finished, as he was too busy piloting his 8 FP (see picture). His main reason for going was to gain experience - which he got, along with the desire to race something in the league of a 1600 Super (he has a 1500 Normal), and he adds:

"The thing I wanted to tell about was the tremendous job done by Gunther Bauerle and especially Rudy Hanke who were there to give free service to all racing cars (Porsches), and who were supplied by Scotty [Norman Scott] of Continental Motors in Houston. Had they not worked for about ten hours a day on all the cars there would have been a number of Beetles not running quite so well on both days. This is a terrific gesture on the part of Scotty--and has done more for customer-dealer relationships in this area than anything done previously."

Tom Donaldson's "fighter", taken at Mansfield, La. races..before or after?..

Eastern Pennsylvania Region

The Eastern Pennsylvania Region has established the last Wednesday of the month as their meeting time. The call to order comes at 8:30 p. m., at the Spring House Hotel, Spring House, Pa. Past meetings have had movies of 1956 LeMans and slides of Sebring.

The coming agenda calls for a talk by Bob Holbert on "Racing the Spyder" and technical discussions. There will be a rallye on June 16 -- for details contact John Case, at 3 Tophill Lane, Levittown, Pa.

AMERICAN FIRM TO HANDLE PORSCHE ENGINES

Formation of a new company, Porsche-Diesel of America, Inc., for the import and sale of air-cooled engines and tractors manufactured by Porsche-Diesel of Germany has been announced. The firm will be located in Bridgeport, Conn., and engines and tractors will be shipped directly to Bridgeport for national distribution.

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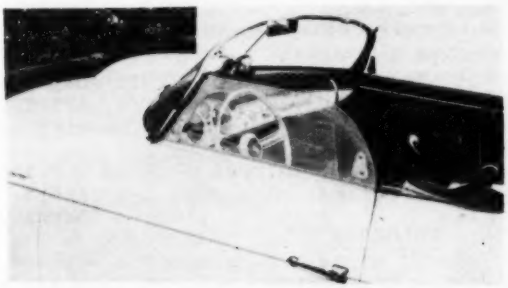

Jesse Adams' home-made side curtains (see his story in April PANO for installation)

INSTALLING TENTHS INDICATOR ON TENTHLESS ODOMETERS

If you have a Porsche odometer without a tenths indicator, one easy method to add this is as follows:

1 Remove speedometer unit from dash.
2 Remove the mechanism from its case. It can be seen that the shaft which carries the indicator wheels for the nonresettable odometer makes one revolution per mile.
3 Obtain one indicator wheel. An old speedometer found in a junk yard will suit. However, any wheel of a similar diameter graduated into 10 equal spaces is satisfactory.
4 Have a machinist extend the nonresettable odometer shaft to accommodate the new wheel. Attach the new wheel and locate it so that it turns from 9 to 0 at the very same time the digit wheel indexes.
5 Cut a hole in the speedometer face opposite the new wheel.
6 Reassemble the unit and install it in the dash.

--Kenneth J. Varker

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FUTURE EVENTS

Johnny Appleseed Rallye, May 26, 1957
Mansfield, Ohio

The first annual Johnny Appleseed Rallye is presented by Mid-Ohio Sports Car Club and has been laid out by our Ohio PCA Regional Director, E. Paul Stephens. It is a four hour long run with the first car starting at 12 noon, from Springmill Drive-In Theatre, two miles northwest of Mansfield.

Classes: Three - "Over-All", "Ladies Team", and "Minus-Tenths", for cars without tenths on their odometers. (Latter 2 classes, eligible for over-all award also.)

Awards: Trophy to driver & navigator for first 14 places over-all and first two places ladies' team and minus-tenths; dead last but finished; dash plaques each driver & navigator.

Entry Fee: $8.00 includes dinner for two, free gasoline at the start.

Write to: F. S. Earnshaw, 133 Lind Ave., Mansfield, O., for entry forms.

Mountain Lake Rallye and Hill Climb
Washington, D. C. May 31-June 2, 1957

Entries are now being received for the 5th annual Mt.Lake Rally and Hill Climb, May 31-June 2, 1957.

The rally will be nearly 500 miles and will last 15 hours terminating at the Mountain Lake Hotel [fine resort, swimming, tennis, boating, etc. - the management prefers guests in skirts or coat and tie in the dining room.]

Entry fee is $15.00 for both rally and hill climb.

Write Bob Yount, 3 Grandin Circle, Rockville, Md. for entry blank or further information.

SECOND ANNUAL
PORSCHE PARADE

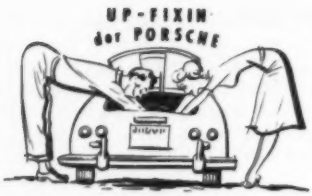
The TIME:
Wednesday, August 21 through Saturday, August 24, 1957.

The PLACE:
Washingtonian Motel, Route 240, just outside Washington, D. C. (near Gaithersburg, Md.) - with swimming pool, tennis courts, restaurant, air-conditioned.

The PROGRAM:
Technical talks and demonstrations... Porsche Factory Engineers & Mechanics Special Movies...Elections...Cocktail Party...Committee Meetings...Rallye.. Driver's School...Acceleration Trials ...Gymkhana...Concours....Trophies... Suppliers' Demonstrations...& Special Gifts.

REMEMBER THE DATE, PLAN TO ATTEND NOW! Entry blanks will be mailed out about June 1.

(Sorry - we had to change the date as announced in the April Panorama.)



Instead of finishing off the transmission-clutch-rear axle assembly series of articles, it has been decided this month to mix up the technical topics a bit with a discussion of the possibilities of modifying the Porsche engine.

For this purpose we decided to discuss in some detail the modifications recently made to a 1300 A Normal engine, that is, a three-piece crankcase type of 1300 cc. engine. In all respects except one, the planned modifications for this engine were entirely standard or routine, but a discussion of those modifications which were made will be at least useful, we hope, to those who may desire to "warm up" the performance of their engine a little.

The one unusual, or at least not strictly standard, modification which was made on this engine was a result of the owner's desire to raise the compression ratio to 8.2 to 1. Since this particular engine, a 1955 model, starts with a normal compression ratio of 6.5 to 1, the amount necessary to remove from the bottom of the cylinder barrels in order to project the piston crown further into the combustion chamber was a bit beyond that which normally is done.

The engine had approximately 45,000 miles on it when the modifications were made and an inspection of the component parts proved that the engine was in very good shape, with a normal amount of ring wear which could be expected from the amount of miles which were on the engine, and the cylinder barrels proved to be in pretty fine shape, the fit between the pistons and cylinders at room temperature being very good.

However, as a matter of interest, it might be noted that there were two abnormalities which became apparent in this engine. One was the fact that the cylinders on one bank were observed to have an unevenness in the depth of the ridge at the top of the cylinders while the other bank proved to have cylinder ridges of substantially uniform depth all the way around. The trouble on the uneven bank was traced to the fact that the two cylinders on that bank were of slightly different lengths, that is, between the block-engaging surfaces and head-engaging surfaces thereof. The difference in length between these cylinders was almost 0.003", about which more later.

The other abnormality was the fact that one of the main bearings had its oil hole badly misaligned with the oil hole in the crankcase, the actual overlap between the two being in the neighborhood of about 50% of the actual total area of the crankcase opening. Inspection of this bearing and the adjacent rod bearing which is also fed through the same oil hole brought on momentary heart palpitations, but after miking up the crankshaft, it was found to be within reasonable wear limits. However, the two bearings in question were very badly scored and pitted and the rod bearing at least was very close to complete failure.

Since the compression ratio was to be raised from 6.5 to 8.2 to 1, some slipstick manipulation revealed that in the neighborhood of 0.135" would have to be removed from the lower end of the cylinder barrels at the block-engaging surfaces thereof in order to effect the desired compression ratio increase, the calculations making use of a fudge factor which was thrown in to accommodate for the fact that the normal piston would have to be chamfered somewhat, to avoid interference with the cylinder head. A reduction of end length of 0.135" was decided upon, and to this end, the engine was removed from the chassis and dismantled to the extent of stripping off all hardware and both cylinder heads. The piston crowns were then covered with dime store clay, and the heads replaced as well as the valve push rods and rocker arms. The engine was then cranked over a few times by hand, whereafter it was stripped back down to see what kind of picture our clay pieces revealed.

As has been past experience with der Porsche, the clay indicated that we could go a mile before any interference would be encountered between the pistons and valves while at the same time, it would be necessary to remove some amount from the outer edge of the piston crown like in amount to that by which the barrels were to be shortened.

This is due to the combustion chamber design, there being a non-uniform ridge within the head chamber which normally clears the piston, at top dead center, by about 0.060". Since we had

decided on ending up with 0.060" clearance over the pistons after the shortening of the barrels, this necessitated a chamfer on the piston crowns of 0.135" depth and on an angle of 30°, since the potentially interfering cylinder head surfaces were machined to this angle.

It was also decided beforehand to electronically balance the engine, so the first step was to further dismantle the engine and chamfer the pistons by the necessary amount, as indicated by the above-described claying process and this was done -- being careful to make an identical chamfer in each case. This work was done on a South Bend 9" Lathe with a dial indicator being used to accurately measure the depth of the chamfer. While we were about it, the cylinder barrels were shortened by the desired amount, 0.135", and for those of you who might be contemplating doing this work yourself or having it done, it is absolutely essential to make sure that all barrels, between block-engaging and head-engaging surfaces, are within 0.001" of each other. This is extremely important and should be checked not only at one point on each barrel, but at several points on each all the way around.

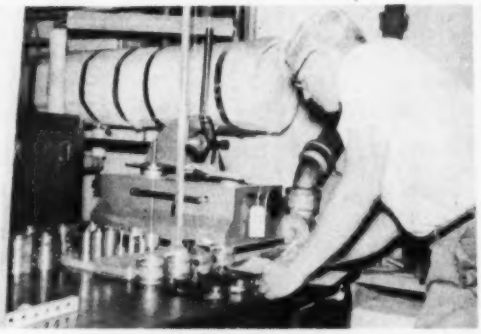
A goof here, and the whole project is shot -- because any difference in length between adjacent cylinders or any surface unevenness will surely result in some weird "goings-on" due to the fact that the alignment of the heads and cylinders is dependent upon the distance between the block and the head-engaging surfaces of the cylinders. Unevenness or disparity in length between the cylinders will cause the head to be cocked from the proper position and, during subsequent running of the engine and the normal expansion and contraction of parts, some very unusual wear characteristics could result, not to mention an abnormal amount of internal engine friction.

While we're on the subject of cylinders and heads, and before we forget it, it is also extremely important to position the cylinder barrels with respect to the head-securing studs such that there is no contact between the cylinders and the studs, since this, too, could result in some queer antics.

After completing the above-mentioned machine work, all moving parts with the exception of the camshaft and valve train were hauled over to our local engine balancer, Adolph More. At this point, we might say that we are very much indebted to Mr. More for his patience and understanding while we peered over his shoulder, took some pictures and made some notes as the work progressed. Dolf is just simply one swell follow, and if you'll pardon the pun, you couldn't find a better balanced personality.

Since the pistons in a Porsche engine reciprocate in a common plane, the same balancing technique as is used for an in-line, four cylinder engine, or for that matter, in-line engines in general, was employed. That is to say, the crankshaft was balanced independently as a unit, and the pistons and rods were weighed and machined to assure all parts were the same weight.

Dolf uses a "Shadowgraph" optical balance, the gizmo you see immediately in front of Dolf in picture No.1, the pistons and rods being immediately to the left of the balance, and with one rod being shown supported in position for weighing the little or piston pin end thereof. The final weight of all pistons, together with their pins, was 326.5 gr., while the finish weight of the reciprocating end of all rods was 152.0 gr., and the rotating ends were balanced to 297.0 gr.



Pic. No. 1

Adolph More recording the weight of the reciprocating end of a rod

It was interesting to note in connection with the balancing of this particular engine that the balance built into the engine at the factory was very good indeed, and in fact, far superior to most production engines. For example, as can be seen from the accompanying table, the maximum variation in piston weight was 3 gr., while the maximum total variation in weight between rods, measuring both the reciprocating and rotating ends, was 4 gr. This is extremely good. It is reported that the production tolerance of Porsche rods and pistons is 5 gr. in each case, and since the assembling mechanic simply assembles the units available,

a maximum deviation or variation between any two piston and rod assemblies would be 10 gr. However, even such a maximum variation would be far better than most production cars.

For example:-- It can be seen from the accompanying chart No. 1, that #4 piston was 3 gr.heavier than the lightest piston, whereas #4 rod was also 3 gr. heavier than the lightest rod, rod #1. However, piston #1 was 0.5 gr. heavier than the lightest piston, so the total maximum weight variation between the furthest apart rod and piston assemblies #1 and #4 was 5.5 gr., which would make this engine probably about average for a Porsche.

CHART I

ENGINE WEIGHT AND UNBALANCE RECORD FOR PORSCHE 1300 A 1955

PISTONS

No.	Weight	Corr.
1	327.0	.5
2	329.0	2.5
3	326.5	---
4	329.5	3.0

RODS

No.	Reciprocating End		Rotating End	
	Weight	Corr.	Weight	Corr.
1	152.0	---	297.0	---
2	153.5	1.5	298.5	1.5
3	153.5	1.5	299.5	2.5
4	153.0	1.0	299.0	2.0

Chart No. 2 shows the unbalance readings of the crankshaft, flywheel, clutch plate assembly and clutch disk, but it is to be noted that the figures for unbalance are purely relative, not being calibrated in metric units, or otherwise. However, of course, the readings could be converted, by suitable conversion factors which weren't available, to standard units.

The balancing unit which Dolf uses is a Stuart Warner industrial electronic balancer and it is a very neat unit indeed. The principle of operation utilizes the natural frequency of a pair of spring arms, which are supported in cantilever fashion on the machine base with movable inverted V-blocks being additionally used to alter the effective pivot points of

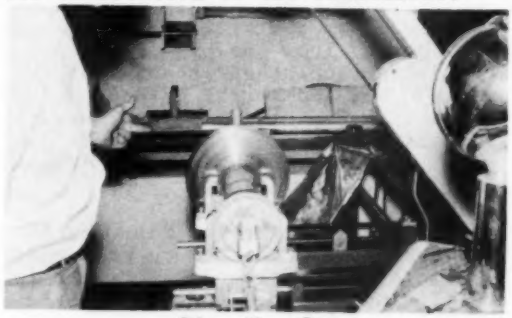
CHART II

UNBALANCE READINGS

Part	Static	D.Pot	RPM
Crankshaft	1.0	2	650
Flywheel	1.6	2	655
Clutch Plate Assy.	3.2	2	660
Clutch	.5	2	755

Part	Dynamic	D.Pot	RPM
Crankshaft	2	2	740
Flywheel	1.6	2	

the supporting arms. Picture 2 clearly shows one of the spring arms and its associated V-block and the worm which feeds the V-block back and forth, to alter the effective length of the spring. In this picture, also, the crankshaft together with the flywheel and the crankshaft pulley are shown in the actual balancing operation, and in this picture, Dolf is pointing to the location of his indicating mark, which indicates the plane of dynamic unbalance, in this particular case. The mark is not visible in the photograph but its location is approximately at 11:00 o'clock, which indicates that when the flywheel is at rest and the mark repositioned to the point at which it appeared during the balancing operation, the flywheel is heavier on the upper side thereof within a vertical plane extending through the center of rotation of the crankshaft.

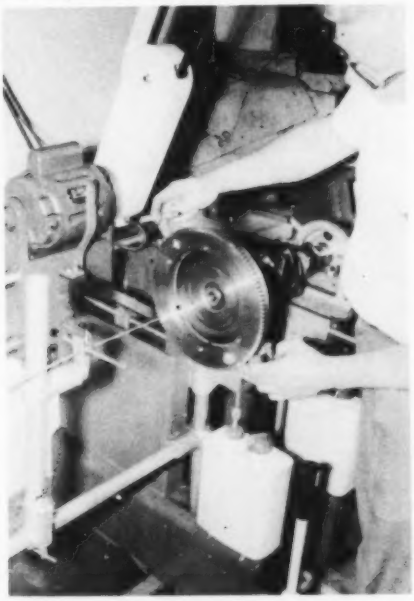


Pic. No. 2

Balancing the flywheel assembly

To correct the unbalance, a mass of putty or clay, corresponding in weight to the total unbalance weight, is applied to the flywheel, in this case, in diametrically opposed relationship to the aforementioned point which was indicated to be the heavy point. Photograph 3 illustrates this point very

clearly, Dolf's right hand pointing to a mark corresponding to the heaviest point of the flywheel, and his left hand pointing to a piece of putty which he had just applied to counteract this unbalance. The assembly is then rotated once again, and further putty is either added or taken away, until the machine registers a balanced condition whereafter the putty is weighed, and a like weight of the flywheel material is removed from the location of the chalk mark, indicated by Dolf's right hand in picture 3.



Pic. No. 3
Counteracting unbalance

Picture 3 also illustrates the two dashpot assemblies, immediately below the crankshaft assembly, which are used to limit the amplitude of vibrations caused by any unbalance in the assembly. Each dashpot assembly is selectively moved in any one of five progressively greater dampening positions, the most accurate balancing being obtained by using the lightest dashpot assembly, dashpot No. 1 in each case. As can be noted from chart No. 2, the engine in question was balanced with dashpot No. 2 which gives a very fine and accurate ultimate balance to the engine.

And as a matter of actual fact the particular engine being discussed was from almost every aspect very closely balanced for a production engine. The only fly in the ointment was the amount of dynamic unbalance in the flywheel, which even though less than that indicated in the entire crankshaft assembly, was nevertheless of considerable concern -- since the thickness of the flywheen assembly is very small indeed and of course the dynamic unbalance is an indication of an unbalance in different planes. In other words, whereas a flywheel or any other object may be in perfect static balance, it could be considerably off in dynamic balance such as was the case here and this is definitely quite objectionable in the Porsche engine since there is only one bolt which holds the flywheel to the crankshaft. Dynamic unbalance in the flywheel would tend to impart a whipping action to the same which at best is undesirable, in view of the particular mounting of the Porsche flywheel to the crankshaft. In other words -- when torquing down the flywheel retaining bolt, you better be sure that plenty of beef is used. As a matter of fact a wrench having the effective over-all length of about 4 or 5 feet is just about right for torquing down the flywheel bolt.

Next on the agenda was a slight reworking of the heads -- and since the owner in this particular case wanted nothing radical, the ports were merely polished, and no attempt was made to remove any material from the valve guides, a considerable portion of which projects into the port area. The only other step employed in the valve and port treatment was, of course, a refacing of the valves and reseating of the heads, and the valves were also reduced somewhat in diameter and somewhat reduced in their head thickness to bring the valve seat contact surface near the outer edge of the valve. Of course, this result could be better accomplished by narrowing the valve seats from the inside, and better still by reaming some of the material from the inside of the valve seats and head surface, but in this particular case, since the ports were only polished and not enlarged, a smoother surfaced and better contoured cross-sectional area was achieved by reducing the valve diameters slightly. For those who are interested, a considerable improvement can be made in the porting by judicious use of a die grinder and suitable burrs or stones, bringing the cross-sectional area thereof closer to Super specifications and by using a Super manifold which gives a considerably greater cross-sectional area of the ports. Of course, with such a treatment, the 40 PBI carburetor is to be preferred. Alternatively suitable manifolds can be fabricated very easily and dual throat carburetors mounted.

The engine was now reassembled, replacing the stock 1300 camshaft with a factory Super camshaft, so as to take better advantage of the increased compression ratio, and new valve springs were now installed also. In order to assure a proper fit between the crankshaft cam gear and the camshaft gear, the crankshaft should be mounted in one-half of the casing, and the camshaft properly positioned with the two gears meshing. The crank should then be turned by hand fairly slowly to observe if there is any tendency for the camshaft to lift out of the casing half within which it rests during such crankshaft rotation. With this particular engine, the Super camshaft gear proved to be a trifle tight in spots, and Prussian blue was used in conjunction with a burnishing tool to smooth out all the high spots on the cam gear which had caused the trouble until the crankshaft could be spun fairly rapidly without the new camshaft having any tendency to pick up out of the casing.

Care should be taken in installing the valve springs to make absolutely certain, in the first place that they are within proper pressure limits. It is recommended that instead of installing the valve springs to the specified length, that they instead be installed to obtain the maximum proper pressure at full compression. This is a little tedious, but can be done quite easily since several thicknesses of shims to be used under the valve springs are available.

Due to the design of this particular type of engine, particular care should be observed in the sequence of tightening the crankshaft casing bolts and in the maximum torque which is applied thereto. The same goes for the cylinder heads and of course, as mentioned previously, care should be taken that at least the minimum torque is applied to the flywheel retaining bolt.

The above modifications are actually on the mild side, but will give a noticeable increase in performance with perhaps a slight decrease in performance below perhaps 2500 rpm. The cam grind supplied by the factory and designated as the Super grind is actually a relatively mild cam grind, at least by the present day standards, and of course, considerably more power can be obtained at the top end by using a wilder grind. However, wilder grinds are not readily available and in any case are not desirable, in most instances, because of the relatively heavy weight of the valve train components, particularly the tappets. If a wilder type of camshaft grind is utilized, heavier valve spring pressures should be used and also some effort should be made to lighten the over-all weight of the valve lifters. In the case of the older, two-piece crankcase type of lifter which has the arcuate cam-engaging end, judicious pruning from the inside of these lifters will effect a weight decrease of roughly 50% and will considerably lighten the load on the camshaft and tappets at higher rpm's. Larger valves could be fitted to the intakes, but probably would prove to be more trouble than they are worth, and, in any event, substantially the same increase in performance could be effected by bringing the valve seats all the way out to the outer edge of the existing valves, with corresponding increase in port area and the use of either a Super manifold in conjunction with the 40 PBI carburetor, or a specially fabricated manifold in conjunction with a suitable dual throat carburetor set-up, such as, for example, a set of Stromberg 48's.

The only carburetor alterations used on the subject engine were those mentioned in an earlier issue of PANO, and the use of 26 mm. Venturis, highly polished. For normal use, 130 main jets are used while at sustained high speed running, 135 main jets are used. Presently, however, a set of 29 mm. Venturis is being fabricated, which will probably necessitate the use of 135 main jets for normal use.

Naturally, fuel consumption is somewhat lowered, as will be expected engine life - but of course this is the price paid for that extra boot.

VOL. I. TECHNICAL INFORMATION

To the nearly-100 members who have written in requesting the proposed compilation of all technical articles appearing in Vol. 1 of PANO:-

This booklet should be ready for mailing some time next month. As yet, the modest price of this reprint has not been determined, but you will be notified.

A multi-purpose aircraft developed by a group of West German inventors has aroused considerable interest abroad. The plane has its engine and propeller fitted into the tail. The engine is a sixty-five horsepower Porsche engine.